

Tri-Service Assessment Initiative Phase 2 Systemic Analysis Results



***Conference on the Acquisition of Software Intensive Systems
January 28, 2003***

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Presentation Objectives

- ***Convey what we have learned through a systemic “Cross Program” analysis of multiple DoD software intensive programs***
- ***Describe and quantify the recurring issues that impact DoD software intensive program performance***
- ***Characterize the identified DoD program performance issues in terms of cause and effect***
- ***Initiate discussion on potential corrective action strategies***

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Phase 2 Overarching Conclusion

The analysis predicts an increasing gap between what is expected and what is capable of being achieved



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Summary Findings

- ***Software intensive system development issues are still pervasive across DoD programs***
- ***New emerging issues reflect complex, risk-prone acquisition trends. These include:***
 - ***interoperability / family of systems***
 - ***co-dependent systems development***
 - ***“mission resilient”, evolutionary system development***
 - ***direct funding - Congressional plus-ups***
 - ***expanded contractor acquisition and program management responsibilities***
 - ***acquisition policy easements***

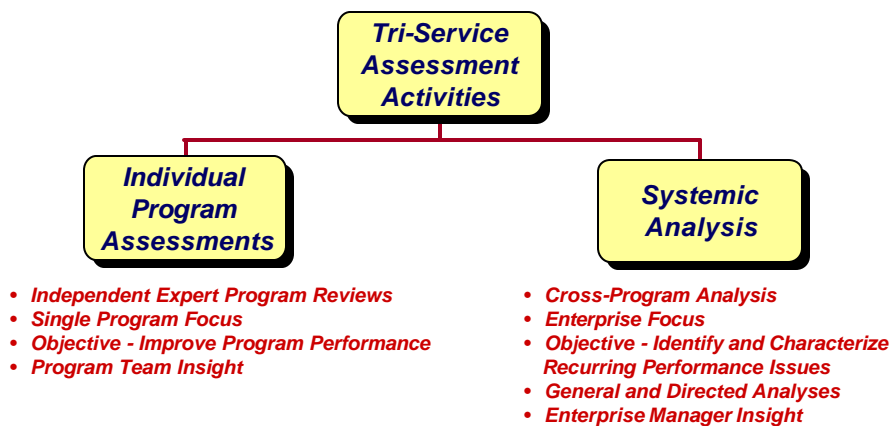
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What You Need to Know

- ***The causes of program performance shortfalls are extremely complex - improvement strategies and associated action plans must address this complexity***
- ***As an Enterprise we need to start by re-addressing the performance issues we thought we were already fixing***
- ***The longer we wait - the higher the risk***

Tri Service Assessment Initiative



Both Activities are Based on an Integrated Assessment Architecture

Systemic Analysis Phases

Phase 1 - Complete July 2001

- Top down analysis approach
- Initial models - proof of concepts
- Assessment architecture integration
- Initial data set - 10 assessments

Phase 2 - Complete December 2002

- Bottom up analysis approach
- Based on quantification of recurring issues and sequences
- Information driven analysis objectives
- Systemic database
- Extended data set - 23 assessments

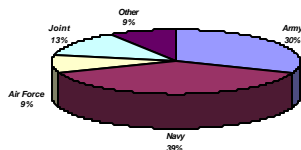
Phase 3 - Began January 2003

- Predictive issue pattern analysis
- Quantification of projected issue impacts
- Architecture and analysis process improvements
- Comprehensive transition program

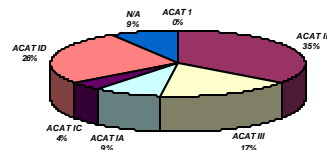
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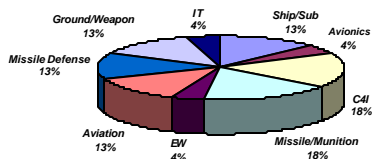
Assessment Distribution



**Distribution of Assessments
by Service**



**Distribution of Assessments
by ACAT Level**



**Distribution of Assessments
by Domain**

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Systemic Analysis Process

Program Assessment Results

Analyze
Assessment Findings

- Systemic Peer Review
- Assessment Characterization
- Issue Identification
- Risk Typology Allocations
- Initial Cause and Effect Model

Basic
Analysis

- Issue Frequency of Occurrence Analysis - Data Normalization
- Enterprise - Program Issue Responsibility Allocations
- Definition of Information Needs
- Issue Concurrency Analysis
- Issue Sequence Identification and Analysis - Interaction
- Issue Characterization - Triggers / Symptoms

Directed
Analysis

- Executive Data Call
- Basic Analysis Review
- Definition - Prioritization of Information Needs
- Individual Case Analysis

Integrated
Analysis

- Issue Correlation
- Risk Analysis
- External Correlations
- Systemic Analysis Model
- Executive Level Conclusions / Summary

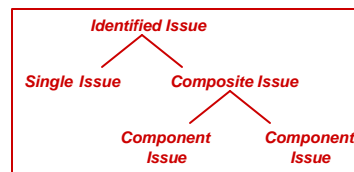
Action Plan

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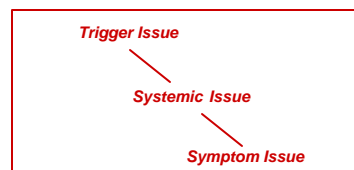
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What Was Counted

- Identified Issues
 - single issues
 - composite issues
 - component issues
- Systemic Sequences
- Systemic Patterns
- Triggers and Symptoms



Issue Structure



Systemic Issue Pattern

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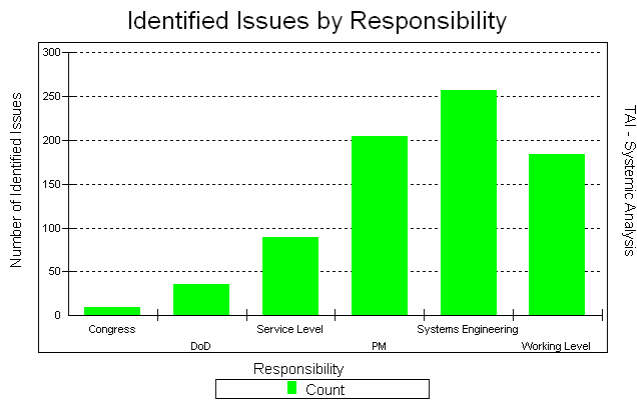
Basic Analysis

Critical program performance problems

Identified Issues	Relative Occurrence
Process Capability	91 %
Organizational Management	87 %
Requirements Management	87 %
Product Testing	83 %
Program Planning	74 %
Product Quality - Rework	70 %
System Engineering	61 %
Process Compliance	52 %
Program Schedule	48 %
Interoperability	43 %
Decision Making	43 %
...	
Configuration Management	26%

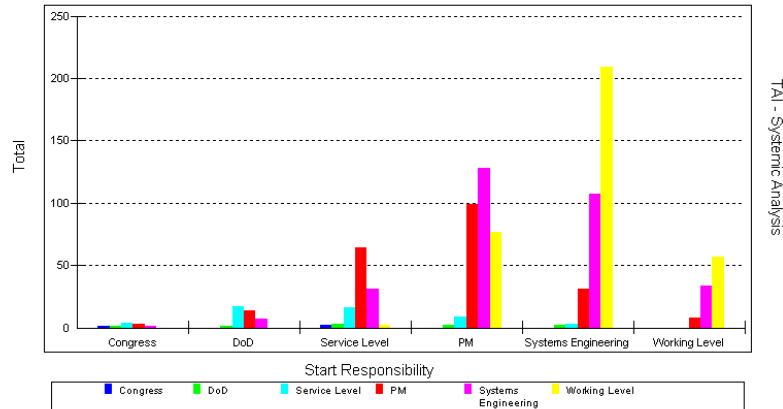
Basic Analysis

Complex issues with multiple interactions across all levels of DoD management



Issue Migration

Sequence Starts - Start Responsibility by Next Responsibility



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Basic Analysis

The primary causative performance issues are:

- **Process capability shortfalls: the inability of the program team to design, integrate, and implement processes that adequately support the needs of the program**
- **Requirements development and management shortfalls**
- **Organizational management and communication limitations**
- **Stakeholder agendas and related program changes**
- **Product architecture deficiencies**

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Cause and Effect Impacts

- ***Process Capability*** problems result in:
 - *Inadequate Testing*
 - *Poor Change Management*
 - *Poor Product Quality*
 - *Progress Shortfalls*
- ***Requirements Management*** problems result in:
 - *Poor Product Quality*
 - *Product Rework*
 - *Progress Shortfalls*
- ***Organizational and Program Management*** problems result in:
 - *Inadequate Program Planning*
 - *Responsibility Conflicts*
 - *Poor Communications*
 - *Product Rework*
 - *Progress Shortfalls*

Basic Analysis

Under pressure, Program Managers make trade-off decisions that impact, in order:

- *Development progress*
- *Product technical performance*
- *Product quality and rework*
- *System usability*
- *Cost*

Basic Analysis Summary

- *The current DoD program issue profile shows little positive impact from past corrective actions, initiatives, and policy*
- *The Program Manager and the Development Team must address the majority of the program issues, even if they are caused by enterprise level decisions or behaviors*
- *Causative issues multiply downstream*
- *The Program Team creates many of their own performance problems*
- *There are no “single issue” program performance drivers*

Directed Analysis

- *Software Engineering Process*
- *Systems Engineering*
- *Software Testing*
- *Program Organization and Communication*

Software Engineering Process

Analysis Results

- 91% of the assessments had process compliance issues (75% triggers)
- 52% of the assessments had process capability issues (63% triggers)
- Predominant deficiencies: requirements, risk / measurement, testing, systems engineering, change management

Implications

- The performance problem extends beyond developer software process compliance
- False assumption that organizational process compliance equates to required program process capability
- Compliant organizations still have significant performance shortfalls
- Key process concerns:
 - a. focus is too narrow in scope
 - b. impacts of program constraints
 - c. large program team process incompatibilities
 - d. program teams just not good enough

Systems Engineering

Analysis Results

- 61% of the assessments had systems engineering issues (23% triggers)
- 11 of the 16 programs that have requirements issues have SE issues
- 43% of the assessments have interoperability issues (50% triggers)
- Predominant deficiencies: Non-existent SE, lack of SE expertise, poor SE implementation, dispersion of SE responsibility and authority, existing SE inadequate for program requirements

Implications

- Cost overruns, schedule slips and rework will continue to plague programs
- The most technically complex systems have the most systems engineering issues
- Interoperability of systems is in doubt
- Rapid exploitation of new/innovative technology is difficult

Systems Engineering Findings

- *DoD programs have significant shortfalls with respect to systems engineering yet this is where most of the identified program issues exist*
- *“Systems engineering by committee” is both common and ineffective*
- *Programs continuously face unfunded and unplanned mandates related to family of systems management and interoperability*
- *Trade off decisions are often extremely constrained*

Systems engineering must take a primary and renewed role in today's DoD programs

Software Testing

Analysis Results

- *83% of the assessments had testing related issues (53% triggers)*
- *Predominant deficiencies: lack of test time, facilities, testing cutbacks, poor test procedures*
- *73% of the programs with schedule problems had testing issues*
- *80% of the programs with requirements problems had testing issues*

Implications

- *Overarching testing risk - late discovery of defects (94%)*
- *Most testing issues result in quality shortfalls and rework*
- *Testing of complex systems is an emerging concern*
- *Primary causes of testing shortfalls:*
 - a. *requirements (71%)*
 - b. *test facilities (71%)*
 - c. *test process capability (65%)*
 - d. *schedule constraints (41%)*

Program Organization and Communication

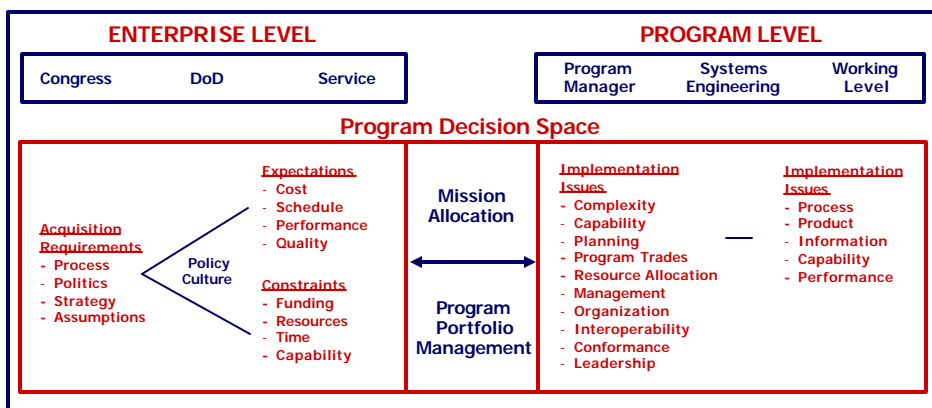
Analysis Results

- 87% of the assessments had communications issues (65% triggers)
- Every program with IPT related issues had communications issues
- Predominant deficiencies: unclear roles and responsibilities, delayed decision making, conflicting decisions, proprietary information (all exacerbated by widely dispersed organizational teams and complex organizational structures not suited for traditional management approaches)

Implications

- IPTs appear to create more management issues than they resolve
- Poor implementation of IPTs: proliferation, structure, membership, authority and decision responsibility issues

Systemic Analysis Model



ACQUISITION ENVIRONMENT
(Threats, Economy, Technology)

New Solution Strategy Required?

- ***Past DoD acquisition solutions (strategies, policies, and initiatives) have had only limited success in reversing poor performance trends:***
 - ***Single point solutions***
 - ***Poorly evaluated***
 - ***Focused on symptoms not causes***
 - ***Lacking in implementation guidance***
 - ***Conflicting***
 - ***Volatile***
 - ***Lack insight into solution effectiveness***
 - ***Long lasting impacts and residuals***

Key Considerations

- ***Need to establish performance parameters that can be implemented with success across the life of the program***
 - ***Feasible plan***
 - ***Understood constraints***
 - ***Change tolerance***
- ***Need to improve the capabilities of the development teams***
 - ***Real systems engineering***
 - ***Funded management and technical approaches critical to interoperability***
 - ***Foundational processes***

Key Considerations

- ***Need to ensure that all program stakeholders agree on an integrated strategy for attacking the high priority overarching program issues***
 - ***Congress and enterprise***
 - ***Program team***
 - ***Education and technology infrastructures***
- ***Need to augment recent acquisition policy changes with***
 - ***A clear understanding of the complex interactions and constraints that programs are faced with***
 - ***Adequate implementation guidance***
 - ***Directed education***

Assessment & Analysis Essentials

- ***Focus on performance improvement***
- ***Enterprise performance is a composite of project performance***
- ***Use a common architecture for project and systemic evaluation***
- ***Address a wide scope of issues and issue sources***
- ***Risk management and measurement processes are critical***
- ***Flexibility is important – typology not taxonomy***
- ***Relate subjective and quantitative information***
- ***Information needs drive the analysis process***
- ***Frequency of occurrence counts are just the first step***
- ***Data integrity – data integrity – data integrity***
- ***Consistent terminology***